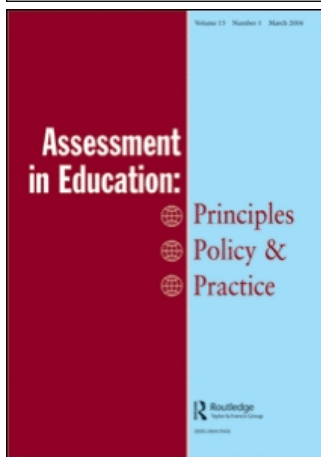


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Developing an Effective Lifelong Learning Inventory: the ELLI Project

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This paper reports the initial results of a study that was designed to develop and test an instrument that could identify the elements of an individual's capacity for lifelong learning. We anticipated that the components of this capacity would include a complex mix of dispositions, lived experiences, social relations, values, attitudes and beliefs and that these various factors would coalesce to shape the nature of an individual's engagement with any particular learning opportunity. The instrument that was developed—the Evaluating Lifelong Learning Inventory—was trialled with pupils across a range of ages and subject to factor analytic study. The data have proved robust over successive factor analytic studies, allowing the identification of seven dimensions of learning power and reliable scales to assess these. These dimensions appear to be capable of differentiating between efficacious, engaged and energized learners and passive, dependent and fragile learners. Whilst further, larger scale field trials will be necessary to confirm these early results, the findings would appear to have significant implications for conventional models of curriculum design and classroom practice.

Background

The history of educational assessment largely concerns attempts to develop either instruments to assess intelligence or instruments to assess educational achievement. Very little attention has so far been given to designing an instrument that is capable of assessing a person's learning orientation—the complex mixture of experience, motivation, intelligences and dispositions that any particular learning opportunity evokes. And yet, it is arguably our characteristics as learners and what we bring to any particular learning situation that will be the most important quality for us to be able to measure in the unpredictable and ever-changing world of the twenty-first century. If the capacity and the desire to learn and to go on learning throughout life is now recognized as a central aspiration in the concept of 'lifelong learning', it is important to develop the means to assess the developing qualities that make up an individual's capacity for lifelong learning. What makes an individual want to engage in learning

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and to be effective at it? Such assessments are potentially both summative, in the sense of ‘*summing up*’ dimensions of an individual’s desire and capacity to learn at any given time and formative, in the sense of helping an individual to become a more enthusiastic and effective learner.

Thus, the overall purpose of the research reported here builds on the analysis of Carr and Claxton (2002). The aim was, firstly, to seek to *identify* the elements that define a good learner. Secondly, it was to devise an instrument that could be used to *assess* where an individual located in relation to these elements at any given time, and in any particular context. A further aspiration was to explore how such knowledge might provide a starting point for *developing* an individual or group’s learning energy. Thus, in parallel with the empirical study reported in this paper, we undertook a developmental study, with a small number of schools and teachers, to see how useful the ELLI tool might prove to be in practice as a basis for practical interventions aimed at improving an individual’s enthusiasm and capacity for learning. This study is reported elsewhere (Deakin Crick *et al.*, 2002a, b). This paper documents the first two purposes of the research.

Lifelong learning and learning energy

An initial step in the design of an instrument to assess an individual’s lifelong learning orientation must be the identification of potential behaviours and factors to be tested. Thus an initial literature review was conducted in order to identify the most likely elements on the basis of existing research.

The characteristics and components of effective lifelong learning identified in other studies highlight the complexity of the task of the research project, which is the subject of this paper. It is a complex and overarching phenomenon that cannot be reduced to only, say a psychological dimension, or a sociological dimension. For there are also biological, ecological, socio-historical, anthropological and critical hermeneutical dimensions related to it. Thus it is interdisciplinary in its scope.

Learning is a *process* carried out by individuals and groups. What is learned counts as knowledge or skill, which can take the form of the ability to do something which could not be done before, or a new understanding about the world, or something of spiritual, emotional or aesthetic significance. The process may take place below the threshold of introspection in the learner’s mind and remain there for many years, or the learner may be aware of the process taking place. Consistent with this perspective is Clark’s (1997) argument that thinking and learning are ‘integrative, whole-body processes that consist of rational, intuitive, affective, sensory and volitional ways of knowing’ (p. 28). He suggests that ‘intelligence/thinking/learning is a single, dynamic, multi-faceted, functional capacity that is inherent in human consciousness. This capacity may be expressed in a variety of modes’ (p. 29).

Existing research indicated that there are at least four broad categories that can be identified as making a substantial contribution to learning. These categories appear to be cumulative, discrete and inter-related dimensions of learning energy. They are:

- *learning capacities*: dispositions, awarenesses and skills
- *learning identity*: the beliefs, values and attitudes about learning, self and knowledge held by the learner;
- *learning story*: the socio-cultural formation of learners over time
- *learning relationships*: the quality and substance of learning relationships.

The components of each of these categories can vary in the degree of their sensitivity to domain, to time and to social context. They may be robust or fragile depending on the context and they are likely to vary over time; and in different social contexts. An individual struggling with French GCSE may be a very different learner from when they are studying for a degree in their chosen subject of physics, for example. We hypothesized, however, that despite the significant differences that were likely to be associated with different subject matter, different reasons for learning—self-imposed studying in order to pass the driving test versus imposed school examination syllabuses, and different contexts—an adult continuing education class of enthusiasts as opposed to a low-stream group of 15-year-olds on a Friday afternoon; there would, nevertheless, be relatively enduring, constant features of a learner's 'profile' as well.

Although there is a range of studies which have identified variables that have an impact on the individual's capacity and motivation to learn, such as self-esteem, locus of control, learning dispositions, goal orientations, learning styles and intrinsic versus extrinsic motivation (Deci & Ryan, 1985; Biggs, 1987; Alsaker, 1989; Katzell & Thompson, 1990; Jonassen & Grabowski, 1993; Maines & Robinson, 1996; Dweck, 1999; Grimsell, 2001), few attempts have been made to explore the notion of the *conglomerate of variables* as they might operate in persons in particular social contexts, and in particular trajectories in time. Thus the study reported here arguably breaks new ground in its attempt to begin to identify these variables and the relationships between them. It is an attempt to be able to provide working hypotheses about the ecology of variables that together make up an individual's learning orientation.

The situated capacity to learn is closely related to the notion of 'motivation for learning' and can be construed as a form of 'energy' which is experienced by learners and which drives their capacity to learn, adapt and change in response to internal and external stimuli. It is influenced by a potentially large range of physiological, affective, conative, cognitive, social, cultural and technical factors—many of which will be outside the learner's awareness. The desire to learn is arguably an innate quality of human beings, rather like breathing. Moreover, the extensive research literatures on the significance of, for example, self-esteem, locus of control, goal orientation, self-efficacy and dispositions suggest a strong link between the intellectual and the emotional components of learning; i.e. that affective, cognitive and conative dimensions are deeply interrelated. Learning is also influenced by variables that are present in the socio-historical environment of the learner—such as significant relationships, cultural tools, worldviews and traditions as well as schooling and other cultural practices. These factors are likely to influence each other in a dynamic trajectory in time.

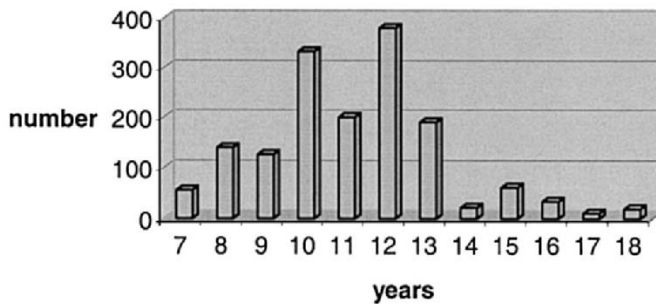


Figure 1. Age distribution of second phase cohort

Figure 1 attempts to describe this.

Building on this broad theoretical framework the research task was then to explore how different aspects of learning might be understood together, and how they might operate within the individual learner and in the relationships and contexts of learning.

The term lifelong learning is one that requires careful definition because it is used widely in contemporary educational discourse and has a range of meanings. It is frequently used to refer simply to adult education, or the acquisition of skills and training beyond school. This project began with a broader conceptualization of lifelong learning, drawing on research such as that by Smith and Spurling (1999) who aimed to define the reach and potential of real lifelong learning. They developed a holistic notion of lifelong learning that comprises two parts.

Firstly, they suggest, lifelong learning relates to learning that takes place *throughout the lifespan*. Secondly, they suggest, lifelong learning includes the main types and classes of learning, both informal and formal education, as well as self-directed learning. Lifelong learning is relatively continuous, with a broad momentum that is maintained throughout life. It is intentional on the part of the individual or the organization and is expressed in some form of personal or organizational strategy, formally or informally, which may be re-appraised over time.

Thus, the accent for Smith and Spurling is on *continuity*, *intention* and an *unfolding strategy* in personal learning. Running through these themes are four principles of *personal commitment to learning*, *social commitment to learning*, *respect for others' learning* and *respect for truth*.

Thus, in mapping out an overall picture of what lifelong learning involves, Smith and Spurling begin to develop ideas about learning identity, or the active learning agent within community.

This broad view of lifelong learning is consistent with Bloomer and Hodkinson's (2000) analysis of learning, based on a longitudinal study of young people and their experiences of learning. They conclude that the explanatory power of learning theory is enhanced when it includes a temporal dimension, and when it addresses how learning is embedded within the complexity of life experiences, in other words, a lateral connectivity.

The research study

As set out above, the core aim of the research was to construct an assessment instrument both to identify the components of lifelong learning and for use subsequently as an assessment instrument. The research was undertaken during the academic year 2000–2001.

Initial items were generated for the instrument from three different sources. The first was an instrument that had been developed in school-based action research which elicited information relating to learning dispositions (Ball, 2001). Secondly, a review of the literature undertaken by the researchers led to the formulation of other items which addressed other potential dimensions of learning energy, such as goal orientation, self-efficacy, self-esteem and so on, in the light of the theoretical framework outlined above. Finally, expert contributions were sought from representatives from other disciplines and from policy-makers.

A draft instrument was designed, *The Effective Lifelong Learning Inventory* (ELLI), with 97 items. Any item that was thought to be relevant and useful was included. The first questionnaire was constructed with a five-point Likert type scale, ranging from strongly agree to strongly disagree.

The ELLI instrument was piloted, refined and then trialled with a cohort of 180 students, including 71 from Key Stage 2 (ages 6–11), 41 from Key Stage 3 (ages 11–14), 26 from a Further Education College (ages 16+) and 42 from an adult vocational study programme (age 18+). The respondents were selected from a range of social, economic and ethnic backgrounds and included an equal mix of genders. Following piloting, additional items were added so that the first phase trial included 112 items.

A factor analytic methodology was selected as an appropriate means of analysing the responses to the instrument since this makes it possible to reduce a large set of potential variables to a smaller set of factors or components. Such an exploration of the inter-correlations amongst the different items would indicate overarching themes or dimensions that could be construed as dimensions of learning. It was anticipated that these dimensions could then be used to identify subscales of items for the assessment of those dimensions in a self-report inventory.

An exploratory factor analytic study of the findings of this phase indicated the presence of nine factors that were theoretically coherent. These produced nine scales, and seven theorized dimensions of learning. It was then possible to eliminate items which did not serve a useful purpose, or which proved to be unclear theoretically. The ELLI was then reduced to 65 items, which included all of those items that had emerged as statistically significant from the factor analytic study and a small number of others which were understood to have some theoretical usefulness, or which were improved upon from the previous study.

The refined ELLI of 65 items was then administered to a cohort of 1064 students, aged between 6 and 18 years. The sample was drawn from 12 different schools, three of which were secondary schools, one an independent school, and two inner city comprehensive schools. The primary schools represented a range of types of school, including an independent school, and a range of state funded primary schools from

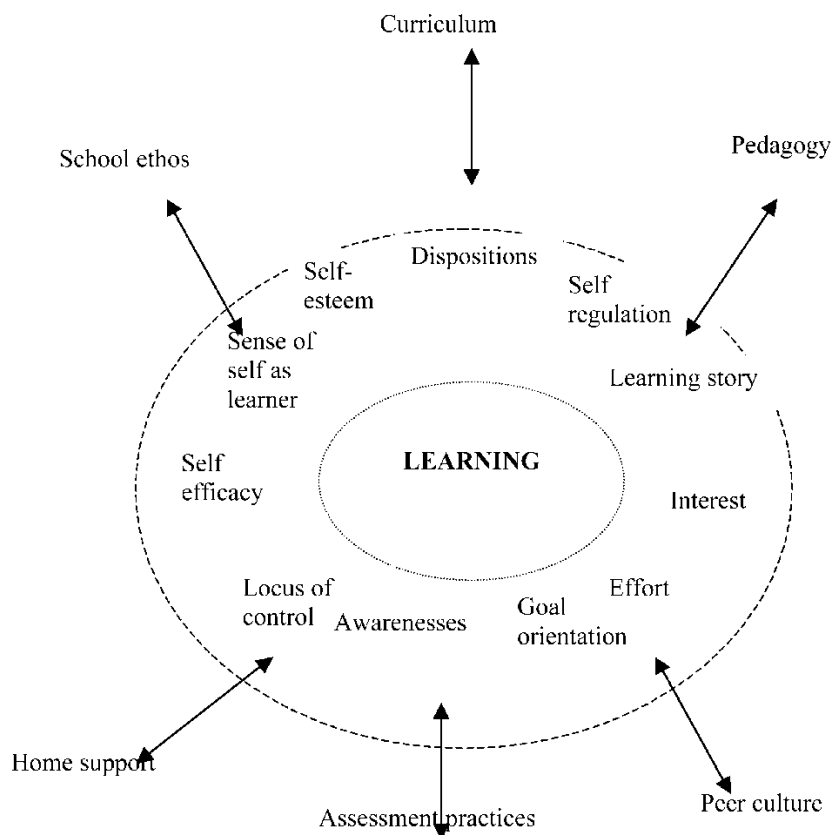


Figure 2. A map of some of the variables that are likely to affect learning

the south-west of England. The sample included a range of ethnicities. Figure 2 demonstrates the age variation of the cohort.

Administration of the ELLI questionnaire

The questionnaire was supplied to teachers with a written page of instructions to support its administration. The students' teacher or a researcher administered the questionnaire. The items would be explained to younger pupils who would then rate themselves on a Likert-type scale of 1–5 ranging from Almost Never to Nearly Always. The data were analysed using SPSS. Accuracy for data entry was checked and was found to be over 99.9%

Factor analysis

The data were first subjected to a confirmatory factor analysis using the items identified from the phase one trial. This confirmed the original factors, and seven theorized dimensions of learning, and identified some weaker items.

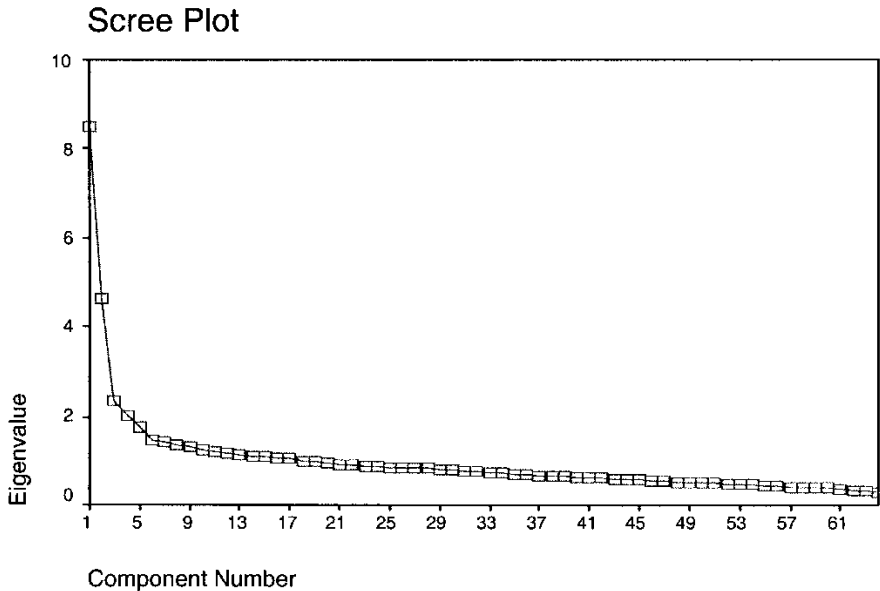


Figure 3. Scree plot

The data was then subjected to further exploratory analysis with varimax rotation. This produced a Kaiser-Mayer-Okin value of .9 and the Bartlett's Test of Sphericity (Bartlett, 1954) reached statistical significance supporting the factorability of the correlation matrix.¹ Principal component analysis revealed the presence of 16 components that accounted for 51.1% of the variance. The scree plot (see Figure 3) indicated a substantial drop after seven components. In the light of this, and consistent with the emerging empirical and theoretical components from the phase one trials, the factor analysis was applied again, this time forcing seven factors. The total variance explained by these seven factors was 35.3%.

The same factor analysis was performed on random samples of 50% of the data and produced very similar factors. Similar factors emerged, although in different orders, when the sample was divided into different age groups, and divided by gender.

However, the forced seven factors accounted for only 35% of the variance, whilst the exploratory factor analysis with eigen values over one accounted for 51.1% of the variance. Thus the construction of scales was undertaken using items from all 16 factors, but utilizing them on scales that represented the seven theorized dimensions of learning derived from the factor analysis that forced seven factors. Within the 16 factors there were factors that theoretically differentiated aspects of key dimensions of learning from the first analysis, and there were sets of factors that were theoretically related, thus supporting the reduction of 16 factors into seven scales representing the seven theorized dimensions of learning. A sample of the items used on the seven scales is provided in Appendix B.²

Scale construction stage two

Further analysis of the factors with eigen values over 1, for the whole sample and for the sample divided into two sections by age (Key Stage 2, ages 7–11 and Key Stages 3, 4 and 5, ages 11–18) made it possible to include four more items and to differentiate the first factor into three theoretically distinct scales. Those scales form part of a larger, more reliable whole dimension. The alpha Cronbach reliability coefficients were computed and are presented for each scale (Appendix A). This was also computed by age group, which indicates that there may be a developmental factor to be taken into account. For example one of the scales—for ‘strategic awareness’, which was derived from the weakest factor statistically—was more reliable for older students than younger ones, suggesting that this dimension may be learned, or a second order dimension.

Seven dimensions of learning energy

These successive statistical operations enabled us to identify what we believe to be some key components of learning. Detailed scrutiny of the loading of the items on the seven factors led to these dimensions being interpreted in terms of the following summary descriptions that are presented in a polarized form here for the sake of clarity. It needs to be stressed, however, that it is important to recognize that these are ‘ideal types’ in that any individual learner is likely to find themselves at different points on each dimension. Moreover, as has been suggested, an individual’s position between the two poles identified for each dimension is likely to vary from time to time and from context to context. At this stage of the analysis the emphasis was on identifying in a robust way the dimensions themselves, rather than the capacity of the scales to characterize particular individuals.

Growth orientation

Some learners appear to regard learning itself as learnable. They believe that, through effort, their minds can get bigger and stronger, just as their bodies can. They see learning as a lifelong process, and gain pleasure and self-esteem from expanding their ability to learn. Having to try is experienced positively: it’s when you are trying that your ‘learning muscles’ are being exercised. A growth orientation includes a sense of getting better at learning over time, and of growing and changing and adapting as a learner in the whole of life. There is a sense of history and hope. The opposite of growth orientation is *fixity*. Other learners appear to believe that the ability to learn is fixed. They therefore experience difficulty negatively, as revealing their limitations. They are less likely to see challenging situations as opportunities to become a better learner.

Critical curiosity

Some learners manifest a desire to find things out. They like to get below the surface of things and try to find out what is going on. They value 'getting at the truth', and are more likely to adopt 'deep' rather than 'surface' learning strategies. They are less likely to accept what they are told uncritically, enjoy asking questions, and are more willing to reveal their questions and uncertainties in public. They like to come to their own conclusions about things, and are inclined to see knowledge as a product of human inquiry. They take ownership of their own learning and enjoy a challenge. The opposite pole is *passivity*. Passive learners are more likely to accept what they are told uncritically, and to believe that 'received wisdom' is necessarily true. They appear to be less thoughtful, and less likely to engage spontaneously in active speculation and exploratory kinds of discussion.

Meaning-making

Some learners are on the lookout for links between what they are learning and what they already know. They get pleasure from seeing how things 'fit together'. They like it when they can make sense of new things in terms of their own experience, and when they can see how learning relates to their own concerns. Their questions reflect this orientation towards coherence. They are interested in the big picture and how the new learning fits within it. They like to learn about what really matters to them. The opposite pole is *fragmentation*. Some learners are more likely to approach learning situations piecemeal, and to respond to them on their own individual merits. They may be more interested in knowing the criteria for successful performance than in looking for joined-up meanings and associations.

Dependence and fragility

Dependent and fragile learners are more easily disheartened when they get stuck or make mistakes. Their ability to persevere is less, and they are likely to seek and prefer less challenging situations. They are dependent upon other people and external structures for their learning and for their sense of self-esteem. They are passive imbibers of knowledge, rather than active agents of their own learning. The opposite of dependence appears to be *resilience & robustness*. Learners with these characteristics like a challenge, and are willing to 'give it a go' even when the outcome and the way to proceed are uncertain. They accept that learning is sometimes hard for everyone, and are not frightened of finding things difficult. They have a high level of 'stickability', and can readily recover from frustration. They are able to 'hang in' with learning even though they may, for a while, feel somewhat confused or even anxious. They don't mind making mistakes every so often, and can learn from them.

Creativity

Those learners who score highly on this dimension are able to look at things in different ways. They like playing with ideas and taking different perspectives, even when they don't quite know where their trains of thought are leading. They are receptive to hunches and inklings that bubble up into their minds, and make use of imagination, visual imagery and pictures and diagrams in their learning. They understand that learning often needs playfulness as well as purposeful, systematic thinking. The opposite pole is *literalness* or rule boundness. These learners tend to be less imaginative. They prefer clear-cut information and tried-and-tested ways of looking at things, and they feel safer when they know how they are meant to proceed. They function well in routine problem-solving situations, but are more at sea when greater creativity is required.

Relationships/interdependence

Learners who score highly on this dimension are good at managing the balance between being sociable and being private in their learning. They are not completely independent, nor are they dependent. They like to learn with and from others, and to share their difficulties, when it is appropriate. They acknowledge that there are important other people in their lives who help them learn, though they may vary in who those people are, e.g. family, friends or teachers. They know the value of learning by watching and emulating other people, including their peers. They make use of others as resources, as partners and as sources of emotional support. And they also know that effective learning may also require times of studying—or 'dreaming'—on their own. The opposite pole is *dependence*. Some learners are more likely to be stuck either in their over-dependency on others for reassurance or guidance; or in their lack of engagement with other people.

Strategic awareness

Some learners appear to be more sensitive to their own learning. They are interested in becoming more knowledgeable and more aware of themselves as learners. They like trying out different approaches to learning to see what happens. They are reflective and good at self-evaluation. They can judge how much time, or what resources, a learning task will require. They are able to talk about learning and about themselves as learners. They know how to repair their own emotional mood when they get frustrated or disappointed. They like being given responsibility for planning and organizing their own learning. The opposite of 'strategic' is *robotic*. Learners with these characteristics appear to be less self-aware, and are more likely to confuse self-awareness with self-consciousness.

Table 1. Revised dimensions of learning

1. Growth orientation	1. Learner commitment and engagement
2. Meaning-making	
3. Critical curiosity	
4. Fragility & dependence	2. Fragility & dependence
5. Creativity	3. Creativity
6. Learning relationships	4. Learning relationships
7. Strategic awareness	5. Strategic awareness

Computing new variables for the seven dimensions of learning

Following this initial analysis of the data, seven new variables were computed based on the seven scales so that a more nuanced analysis could be undertaken in relation to differentiated samples of the population. These are described as *Growth orientation*, *Meaning-making*, *Critical curiosity*, *Fragility and dependence*, *Creativity*, *Learning relationships* and *Strategic awareness*. The first three variables, growth orientation, meaning-making and critical curiosity, combine together statistically to form one variable, which we describe as learner commitment and engagement. This meant that we now could also work with five dimensions of learning. This is explained in Table 1 below.

Overarching constructs

The relationship between the ensuing five dimensions was investigated using a Pearson product-moment correlation coefficient. Self-efficacy and commitment, creativity, and strategic awareness were strongly positively correlated, with each coefficient reaching significance at the 0.01 level (two tailed). Learning relationships was positively correlated with self-efficacy and commitment and with fragility & dependence, with each coefficient reaching significance at the 0.01 level (two tailed). It would appear therefore that high levels of self-efficacy and commitment are associated with high levels of creativity, learning relationships and strategic awareness. However fragility and dependence was strongly negatively correlated with self-efficacy and commitment, creativity and strategic awareness. Interestingly, it was positively correlated with learning relationships, with each coefficient reaching significance at the 0.01 level (two tailed). The Pearson product moment correlation table is presented in Appendix C. It appears thus that learning relationships can be associated with both fragility dependence and dependence and with what would appear to be more positive dimensions of learning.

In order to explore further possible links between high levels of self-efficacy and commitment, creativity and strategic awareness as possible indicators of effective learners and of high levels of dependence as a possible indicator of ineffective learners, a K-Means cluster analysis was performed on the data to differentiate between individual learners in the cohort. Two clusters were computed to see whether an initial analysis could discriminate between different types of learners.

Table 2. Final cluster centres: two clusters

Final Cluster Centres	Cluster	
	1	2
Self efficacy & commitment	60.43	78.96
Dependence & fragility	48.03	42.99
Creativity	44.31	65.18
Strategic awareness	46.38	65.04
Learning relationships	59.51	63.66

Table 3. Final cluster centres: three clusters

Final Cluster Centres	Cluster		
	1	2	3
Self efficacy & commitment	61.82	80.79	62.87
Dependence & fragility	55.62	43.15	40.38
Creativity	44.66	67.19	48.08
Strategic awareness	45.08	67.68	50.23
Learning relationships	72.88	65.14	48.60

The results confirmed the initial hypothesis. They suggested the presence of two statistically distinct groups of cases within the data set. On the one hand were those cases that scored significantly higher on self-efficacy and commitment, creativity, learning relationships and strategic awareness and significantly lower on dependence. On the other were those cases that scored significantly higher on dependence and lower on the other three dimensions. These results suggest that the scales are capable of distinguishing between different types of learner. On the basis of this self-report questionnaire, one group is characterized as having a high degree of self-efficacy and commitment, a high level of creativity, strategic awareness and learning relationships and a lower level of dependence whilst the second group tends towards the opposite pole (see Table 2).

In order to see whether these variables could distinguish between more groups of learners, a further K-Means cluster analysis was performed, this time computing three clusters. The final cluster centres indicate the possibility of a more nuanced analysis. Cluster two appears to be the effective learners, as in the first computation. The first cluster is low on self-efficacy and commitment, high on dependence and fragility, low on strategic awareness but high on learning relationships. The third clusters are low on self-efficacy and commitment, low on dependence and fragility, creativity, strategic awareness and learning relationships. Thus the variable that most distinguishes cluster one from cluster three is learning relationships (see Table 3).

Table 4. Final cluster centres three clusters, seven variables

Final Cluster Centres	Cluster		
	1	2	3
Self efficacy & commitment	62.82	77.27	66.89
Dependence & fragility	42.71	42.92	51.40
Creativity	48.27	63.99	49.65
Strategic awareness	50.21	63.45	51.36
Learning alone	56.66	69.79	26.94
Community relationships	48.75	85.96	78.16
Learning with others	50.22	62.28	79.71

In order to explore the variable of learning relationships further, the variable measuring learning relationships was broken down into three reliable scales, from which new variables were computed. These scales distinguished between those who preferred to learn alone, those who preferred to learn with others and those who had positive learning relationships at home and in the community. This gives a more nuanced interpretation. The final cluster centres for this analysis are presented in Table 4, which shows that:

- the learners, in cluster 2 score highly on all variables apart from a low score on dependence and fragility. In other words in their learning relationships they like to learn with others, *and* they like to work alone *and* they have positive learning relationships at home and in the community;
- those in cluster 1, are the learners with the lowest score on the variable for learner commitment and engagement, they have a lower level of dependency, they prefer to learn alone, they have a lower level of learning relationships in the community and they have a lower level of preference for learning with others;
- the third cluster who score relatively highly on the variable for self-efficacy and commitment, have a higher level of dependence, do not like to learn alone, have a high level of learning relationships in the community and a high level of preference for learning with others.

This may suggest that cluster 1, who prefer to learn alone and are not particularly strategically aware or self-efficacious, represent the type of learner who is effective in the schooling system in terms of existing structures and achievement, but may not be particularly effective as a *lifelong* learner where the learning pathway is less directed and in contexts of change, challenge or failure (see Table 4).

The data indicate the presence of two overarching constructs—that of the active and efficacious learner and the passive and more dependent learner. The characteristics of the first group can be subdivided into qualities, which are theoretically and statistically distinct from each other, but are nevertheless correlated.

Comparisons of means

It was anticipated that scores on the learning dimensions would vary across groups as well as between individuals. Age, for example, was hypothesized as likely to be a key variable. In order to explore this hypothesis, a one-way between groups analysis of variance, with multiple comparisons of means tests (Tukeys) was conducted to explore the impact of age on learning dimension scores. For this exercise all seven dimensions were used and only the time one cohort was used so that no cases were included twice. The cohort was divided into three groups, group one was Key Stage 2 (age 7–11) $N=525$, group two was Key Stage 3 (age 11–14) $N=417$ and group three was Key Stage 4 and above (14–18) $N=73$. It needs to be pointed out, however, that this third group comprised both a very small number of respondents and was drawn from a non-representative population. The findings for this group are therefore at best only indicative.

There was a statistically significant difference at the $p < .05$ level in scores for the three age groups on five dimensions. These were: growth orientation $F=10.78$ $p=.000$; meaning-making $F=5.48$, $p=.004$; creativity $F=15.02$, $p=.000$, critical curiosity $F=9.328$ $p=.000$ and learning relationships $F=15.161$, $p=.000$. The changes on fragility and dependence, learning relationships and strategic awareness did not reach statistical significance.

The cohort thus emerged with different learning profiles according to age group. These are shown in the ANOVA table (see Table 5).

The post hoc tests (Tukey Alpha 0.05) indicate that these changes are significant between Key Stage 2 and three, as well as between Key Stage 3 and four (see Table 6)

An examination of the means plots produced by this computation suggests a trend for the means on six effective learning dimensions to drop significantly between Key Stages 2 and 3, and to recover in Key Stage 4 plus. (See Table 7). However, as has already been pointed out, the cohort in Key Stage 4 all came from one school, an independent secondary school, and is particularly small ($N=73$). This indicates that this may be a school effect and should be interpreted with care.

It needs to be stressed that ELLI is a self-report questionnaire. Thus the difference in responses between the age groups that we discuss here reflect how students *feel* about themselves rather than representing any *objective* measure. It may be, for example, that there are significant reasons why students at Key Stage 3 think of themselves as less creative than those in Key Stage 2 even though this may not be the case in practice. The results are nevertheless interesting in these terms since they highlight significant differences in students' self-image at different ages. Further work will be needed to establish how far this might be a school effect, a generic age effect or the result of more general differences in emphasis in, for example, curriculum and assessment practices. It also needs to be stressed once again that the responses are domain specific in that they have been gathered from students whilst working with particular teachers and or subjects. It could well be the case that results from ELLI gathered during leisure learning activities such as sports or hobbies would have produced a rather different profile. Again an exploration of how robust the learning

Table 5. Analysis of variance table

ANOVA						
	Sum of Squares	df	Mean Square	F	Sig.	
Self efficacy & commitment	Between groups	3286.252	2	1643.126	8.803	.000
	Within groups	163128.5	874	186.646		
	Total	166414.8	876			
Dependence & fragility	Between groups	73.452	2	36.726	.177	.838
	Within groups	188884.9	908	208.023		
	Total	188958.3	910			
Creativity	Between groups	3909.578	2	1954.789	9.222	.000
	Within groups	190554.1	899	211.962		
	Total	194463.7	901			
Strategic awareness	Between groups	237.842	2	118.921	.519	.596
	Within groups	212119.4	925	229.318		
	Total	212357.2	927			
Learning relationships	Between groups	7400.046	2	3700.023	15.161	.000
	Within groups	221109.7	906	244.050		
	Total	228509.8	908			
Growth orientation energy	Between groups	7252.454	2	3626.227	10.788	.000
	Within groups	319339.7	950	336.147		
	Total	326592.2	952			
Meaning making	Between groups	2364.703	2	1182.351	5.483	.004
	Within groups	196439.2	911	215.630		
	Total	198803.9	913			
Curiosity challenge seeker	Between groups	3744.477	2	1872.238	9.328	.000
	Within groups	181437.2	904	200.705		
	Total	185181.7	906			
Imagination creativity playfulness	Between groups	6158.228	2	3079.114	15.027	.000
	Within groups	183800.7	897	204.906		
	Total	189958.9	899			
Learning with others	Between groups	2503.116	2	1251.558	2.447	.087
	Within groups	485863.7	950	511.436		
	Total	488366.9	952			
Learning alone	Between groups	3347.057	2	1673.528	2.793	.062
	Within groups	572882.5	956	599.250		
	Total	576229.6	958			
Community relationships	Between groups	2523.439	2	11261.719	21.971	.000
	Within groups	483344.5	943	512.560		
	Total	505868.0	945			

dimensions identified in this study prove to be in less formal contexts and across different subject settings will be an important next stage in the research in establishing how generic lifelong learning dispositions might be.

A further hypothesis anticipated a possible school effect in these results. In order to explore the different profile of scores on learning dimensions between schools, four

Table 6. Tukey HSD multiple comparisons

Dependent Variable	(I) keystone	(J) keystone	Mean Difference (I-J)	Std. Error	Sig.
Creativity	2.00	3.00	3.4739(*)	1.01944	.002
		4.00	6.2308(*)	1.86419	.002
	3.00	2.00	-3.4739(*)	1.01944	.002
		4.00	2.7568	1.90266	.316
	4.00	2.00	-6.2308(*)	1.86419	.002
		3.00	-2.7568	1.90266	.316
Learning relationships	2.00	3.00	1.4857	1.08824	.360
		4.00	11.0125(*)	2.00006	.000
	3.00	2.00	-1.4857	1.08824	.360
		4.00	9.5269(*)	2.03885	.000
	4.00	2.00	-11.0125(*)	2.00006	.000
		3.00	-9.5269(*)	2.03885	.000
Growth orientation energy	2.00	3.00	5.7671(*)	1.24682	.000
		4.00	1.5382	2.31106	.784
	3.00	2.00	-5.7671(*)	1.24682	.000
		4.00	-4.2289	2.35605	.172
	4.00	2.00	-1.5382	2.31106	.784
		3.00	4.2289	2.35605	.172
Meaning-making	2.00	3.00	1.8469	1.02266	.168
		4.00	-4.1784	1.84500	.061
	3.00	2.00	-1.8469	1.02266	.168
		4.00	-6.0253(*)	1.88401	.004
	4.00	2.00	4.1784	1.84500	.061
		3.00	6.0253(*)	1.88401	.004
Curiosity challenge seeker	2.00	3.00	3.9817(*)	.99100	.000
		4.00	-1.0562	1.79094	.826
	3.00	2.00	-3.9817(*)	.99100	.000
		4.00	-5.0379(*)	1.83024	.017
	4.00	2.00	1.0562	1.79094	.826
		3.00	5.0379(*)	1.83024	.017

* The mean difference is significant at the .05 level.

schools were selected from the data. The one-way between groups analysis of variance for these schools indicated a statistically significant difference in the means between schools at the $p < .05$ level on all learning dimensions, thus supporting the notion that learning profiles vary with context and domain and that there may be a school effect. More research into this issue is required.

Differences between males and females

An independent-samples t-test was conducted to compare the learning profiles for males and females.³ The significant gender differences indicate that in this study, girls scored more highly on dependence and fragility, creativity and learning relationships and boys scored more highly on strategic awareness and critical curiosity. Table 8

Table 7. Descriptive statistics for ANOVA dimensions by Key Stage

Dimension	Key Stage	N	Mean	Std. Deviation
Self efficacy & commitment	2.00	463	70.0108	13.46994
	3.00	343	66.7298	14.36169
	4.00	71	72.8404	11.18884
Dependence & fragility	2.00	479	46.3371	15.08050
	3.00	362	46.0698	13.56349
	4.00	70	47.1753	14.12410
Creativity	2.00	474	55.8736	14.76196
	3.00	358	52.3997	14.70186
	4.00	70	49.6429	12.22760
Strategic awareness	2.00	485	55.1546	14.82089
	3.00	370	54.2905	15.93746
	4.00	73	55.8790	12.95163
	Total	928	54.8671	15.13539
Learning relationships	2.00	475	62.5205	16.32758
	3.00	364	61.0348	14.86094
	4.00	70	51.5079	14.53556
	Total	909	61.0775	15.86388
Growth orientation energy	2.00	500	73.5000	17.96146
	3.00	381	67.7329	19.49167
	4.00	72	71.9618	14.03408
Meaning making	2.00	479	65.1953	14.69175
	3.00	362	63.3485	14.73625
	4.00	73	69.3738	14.37124
Curiosity challenge seeker	2.00	478	61.9299	14.27591
	3.00	357	57.9482	14.20810
	4.00	72	62.9861	13.19303
Imagination creativity playfulness	2.00	479	61.3605	14.35477
	3.00	351	57.0038	14.44566
	4.00	70	53.5317	13.33368
Learning with others	2.00	497	64.7049	23.52104
	3.00	383	63.6858	21.58965
	4.00	73	58.4475	21.53867
Learning alone	2.00	499	50.8851	26.15944
	3.00	389	51.6281	22.74774
	4.00	71	58.2160	21.15199
Community relationships	2.00	490	73.4354	22.48079
	3.00	384	70.5512	22.77031
	4.00	72	54.5139	23.02179

shows the actual mean differences between the genders, whilst the statistically significant differences are described in the footnote.

Relationships among the variables

The data were subjected to a standard multiple regression analysis to explore how well the variables of creativity, self-efficacy & commitment, learning relationships and

Table 8

Learning Dimension	Gender	N	Mean	Std. Deviation	Std. Error Mean
Dependence & fragility	female	687	46.7944	14.53864	.55468
	male	760	44.6770	13.89028	.50385
Strategic awareness	female	705	53.8948	14.91357	.56168
	male	778	55.6127	15.17356	.54400
Learning relationships	female	687	63.5533	15.58518	.59461
	male	760	59.2105	15.82637	.57408
Growth orientation energy	female	720	71.4497	17.44357	.65008
	male	796	70.0298	19.75133	.70007
Meaning making	female	693	65.0021	14.26061	.54172

dependence predicted students' sense of strategic awareness. It was hypothesized that strategic awareness might be a second order characteristic, that is, it is developed in a learner as a result of other factors. The results indicated that the predictive variables of self-efficacy and commitment, dependence, creativity and learning relationships accounted for 42.7% of the variance in strategic awareness (adjusted R square=. 427). The standardised beta coefficients indicated that creativity made the strongest contribution to explaining that variance (beta=.41), with learner commitment and engagement (beta=.3) dependence (beta=.07) and learning relationships (beta=.047) making significant, but smaller contributions. See Appendix D.

Discussion of findings

The data indicate that it is possible to differentiate between learners using the dimensions generated from this study. The scales generated from the ELLI self-report inventory identify relatively robust characteristics of learners which appear to be capable of identifying two or three more generic types of learner. The 'learning profiles' of these groups can be understood as comprising a number of dimensions that can be focused on separately or as a whole. Learner commitment and engagement, for example, can be broken down into three component parts, those of growth orientation, meaning-making and critical curiosity. Learning relationships can be broken down into three subscales, those of independence, dependence and interdependence. Creativity emerged as a distinct construct as did learning relationships and strategic awareness. The dimension of fragility and dependence is negatively correlated to the other dimensions. It is possible to argue that the concept of resilience is an alternative pole of fragility and dependence. The theorized relationship between these dimensions of learning is set out in Figure 4.

The construct of the first main factor, learner commitment and engagement seems to be a motivational factor, related to the notion of 'ownership', growth over time and sense-making. Perhaps the most accurate phrase to capture this construct is efficacy,

Emerging Pole (7)		Contrast Pole
1. Growth orientation	Self efficacy & commitment	Stuck & static
2. Meaning-making		Fragmentation
3. Critical curiosity		Passivity
4. Resilience		Dependence & Fragility
5. Creativity		Rule bound
6. Learning Relationships	Learning alone	Dependence/isolation
	Learning with others	
	Community relationships	
7. Strategic Awareness		Robotic

Figure 4. Dimensions of learning showing emerging and contrast poles

energy and engagement with a lateral and a temporal dimension. These dimensions may be subsumed into the broad term ‘empowerment’. Whilst it may be useful, and indeed more accurate, to use this whole construct when assessing learners, it is also useful in practice to be able to break it down into some component parts.

The constructs, which have to do with relationships, appear somewhat complex. Items referring to preferences for learning alone emerged strongly together and loaded negatively onto items relating to working from and with other people. However judging from the factors and the concepts at work in schools, it is possible to argue that the isolated individualist learner is unlikely to be as effective as the learner who readily learns with and from other people, yet is able to learn alone, and who has positive learning relationships at home and in the community. Being independent as a learner, in the popular use of the term in schools, is not the same as being isolated and individualist. Parallel work with teachers (Deakin Crick *et al.*, 2002b) suggested that those learners who are able to work well with others also work well on their own when necessary. Furthermore the construct of dependence emerged as relevant to *dependency on a range of factors*, not just on other people. Thus the final dimensions refer to positive learning relationships with a contrasting pole of isolation and individualism.

The data further reveal the significance of the variables of creativity, self-efficacy and commitment, dependence and learning relationships as the key predictors of

strategic awareness. This is consistent with the notion of strategic awareness as a 'learned' or second order construct, which primarily has to do with the articulation of one's own intentions, thoughts and feelings about any learning task. This requires language and thought, creativity, a process of 'naming' and it occurs in relationships over time. The now substantial research literature on the need to *teach* students the skills of self-assessment and target-setting (Dann, 2002; Ecclestone, 2002; Clarke, 2003) would tend to confirm this view.

The construct of learning relationships at home, in the community and in the family is important in that this construct moves further beyond the boundaries of the individual and into the domain of culture, history and tradition. An item in the ELLI questionnaire that referred to stories as an important source of learning loaded on to this factor. Learning relationships is also a construct that is subject to the political, economic and social circumstances of the learner. There are indications from this research that religious/cultural differences amongst learners may have an impact on the quality of their learning relationships and therefore on their capacity for strategic awareness.

Issues of language, dialogue, imitation and modelling are central for the development of learning. There is a link to the Vygotskian notion of *perezhivanie* which has to do with the lived experience of the learner rooted in the past, but also shaping the future, operationalized in the 'zone of proximal development' in the present learning situation. The concept moves beyond a focus on either cognition or affect to suggest a more dynamic, holistic and socially situated notion of learning (Mahn & John-Steiner, 2002).

Conclusions

The data we present here were derived from the application of a learner self-report inventory, The Effective Lifelong Learning Inventory (ELLI). As such, the implications of our study must be seen in the light of how learners themselves feel about learning rather than from a more external measure of learner orientation—if indeed this were possible. However, the data have proved to be robust and indicative of key themes through successive statistical analyses. It is clear that learners engage differentially with learning opportunities and that schools and classrooms vary in relation to their impact on students' sense of themselves as learners. There are indications too that the experience of schooling at least among the English students in our sample, may be making learners progressively more dependent on the teacher and less creative and self-motivated. This would indicate, as might be anticipated, that the nature of pedagogy, curriculum and assessment, and the values expressed through the practices and processes of teaching and learning are likely to have a powerful impact on the way students engage with learning opportunities and develop as learners.

This paper has reported the development of an assessment tool that aims to address the current dearth of assessment instruments concerned with something more than measuring performance and achievement. It takes as its starting point the clarion call for a significant change in the way we think about education as set out, for example, in

Claxton (1999), in which the focus is on what learners themselves bring to the learning situation rather than on the content that the teacher is seeking to deliver. The more the world becomes uncertain and unpredictable, the more difficult it is to decide what curriculum content it will be important for young people to master to equip them for the future. What is becoming increasingly clear, however, is that *being a good learner* is likely to be the key, being able and willing to engage enthusiastically and effectively with learning as new needs dictate and new opportunities arise.

Progress towards this goal is currently painfully slow, not least because of the growing domination of 'high-stakes' conventional assessments of performance which are increasingly encouraging teachers around the world to 'teach the test' whilst at the same time demotivating the significant numbers of learners who do not achieve success in these terms (Harlen & Deakin Crick, 2003). The ELLI project represents one step towards redressing this balance. Firstly it has provided a statistically robust identification of what would appear to be some of the main dimensions on which learners differ. Secondly, it represents a tool that can be used diagnostically by teachers and others to articulate with their students what it is to learn. Teachers and trainers will be able to use the instrument to diagnose the characteristics of both individual learners in their care and of whole classes, with a view to helping develop those characteristics that most support future learning. Thirdly, the ELLI project has also begun to show what may be happening to children as they go through school under the present traditions of teaching and learning, suggesting that they may well be becoming increasingly dependent learners.

Clearly, the results presented here are the first stage of what must be a continuing process of research. In particular we need to ascertain how the learning dimensions identified link with more conventional measures of achievement in order to identify empirically what seem likely to be the characteristics of effective learners—at least in the conventional sense of school performance. Secondly, we need to explore how ELLI can most effectively be used in practice by teachers and trainers to develop effective learning orientations in their students. Thirdly, we need to explore how far the learning dimensions generated are constant across cultures and ages, across different learning settings—formal and informal and in different institutional contexts. In short, the ELLI project is one of a number of initiatives in the field of curriculum and assessment which represent the beginning of a journey towards putting the learner centre-stage in the educational process; in which it is learners' perspectives, their capacities and their motivation and the quality of their relationships that become the starting point for teaching rather than the more usual curriculum content. If contemporary assessment practices have been the major formative influence shaping the world of education today (Broadfoot, 1996), they are likely to be just as influential in shaping the educational world of tomorrow.

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Guy Claxton is Visiting Professor of Learning Science at the University of Bristol Graduate School of Education. His latest books are *Hare brain, tortoise mind: why intelligence increases when you think less* (Fourth Estate, 1997) and *Wise up: the challenge of lifelong learning* (Bloomsbury, 1999).

Notes

1.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.900
Bartlett's Test of Sphericity	Approx. Chi-Square	16755.207
	df	2016
	Sig.	.000
2. The factor loading tables and total variance explained tables are available from the authors on request.
3. There was a significant difference in the score for dependence and fragility for males ($M=44.68$, $SD=13.89$) and females ($M=46.79$ $SD=14.53$); $t=2.82$, $p=.005$) There was a significant difference in the score for strategic awareness for females ($M=53.89$ $SD=14.91$) and males ($M=55.61$ $SD=15.17$); $t=-2.19$, $p=.02$. There was a significant difference in the score for learning relationships for males ($M=59.21.77$, $SD=15.82$) and females ($M=63.55$, $SD=15.58$); $t=5.25$, $p=.000$). There was a significant difference in the scores for critical curiosity for females ($M=59.04$, $SD=14.13$) and males ($M=61.01$, $SD=15.09$); $t=-2.54$, $p=.01$. There was a significant difference in the score for creativity for females ($M=59.85$, $SD=14.02$) and males ($M=57.67$, $SD=15.21$); $t=2.82$, $p=.005$.

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Appendix A. Cronbach alpha coefficients phase two seven scales

Scale	KS2	KS345	All
Growth orientation	.64	.72	.69
Curiosity, energy	.66	.75	.71
Meaning-making	.59	.66	.62
Creativity	.65	.69	.68
Dependence	.71	.70	.70
Learning relationships	.68	.67	.68
Strategic awareness	.43	.57	.50

Appendix B. Samples of items used in the seven scales

Growth orientation

I expect to go on learning for a long time
I like to be able to improve the way I do things
I'm continually improving as a learner

Curiosity, challenge seeker energy

I don't like to accept an answer till I have worked it out for myself
I like to question the things I am learning
Getting to the bottom of things is more important to me than getting a good mark

Meaning-making

I like to learn about things that really matter to me.
I like it when I can make connections between new things I am learning and things I already know
I like learning new things when I can see how they make sense for me in my life

Imagination, creativity, playfulness

I get my best ideas when I just let my mind float free
If I wait quietly, good ideas sometimes just come to me.
I like to try out new learning in different ways.

Fragility and dependence

When I have trouble learning something, I tend to get upset.
When I have to struggle to learn something, I think it's probably because I'm not very bright.
When I'm stuck I don't usually know what to do about it.

Strategic awareness

If I get stuck with a learning task I can usually think of something to do to get round the problem
If I do get upset when I'm learning, I'm quite good at making myself feel better
I often change the way I do things as a result of what I have learned

Learning relationships

I like working on problems with other people.
I prefer to solve problems on my own.
There is at least one person in my community who is an important guide for me in my learning.

Appendix C. Pearson product-moment correlation coefficients for five dimensions

Correlations		LEARN6PC	DEPEN6PC	CREAT6PC	STRAT6PC	RELA6PC
LEARN6PC	Pearson	1	-.110**	.600**	.553**	.110**
	Correlation					
	Sig. (2-tailed)	.	.000	.000	.000	.000
	N	1407	1338	1322	1366	1346
DEPEN6PC	Pearson	-.110**	1	-.134**	-.160**	.263**
	Correlation					
	Sig. (2-tailed)	.000	.	.000	.000	.000
	N	1338	1452	1357	1407	1381
CREAT6PC	Pearson	.600**	-.134**	1	.587**	.038
	Correlation					
	Sig. (2-tailed)	.000	.000	.	.000	.167
	N	1322	1357	1437	1387	1358
STRAT6PC	Pearson	.553**	-.160**	.587**	1	.046
	Correlation					
	Sig. (2-tailed)	.000	.000	.000	.	.087
	N	1366	1407	1387	1488	1401
RELA6PC	Pearson	.110**	.263**	.038	.046	1
	Correlation					
	Sig. (2-tailed)	.000	.000	.167	.087	.
	N	1346	1381	1358	1401	1452

**, Correlation is significant at the 0.01 level (2-tailed).

Key:

LEARN6PC=Self efficacy and commitment

DEPEN6PC=Fragility and dependence

CREAT6PC=Creativity

SRATPC=Strategic awareness

RELA6PC=Learning relationships

Appendix D. Regression model summary

Model Summary ^b				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.655 ^a	.430	.427	11.68999

a. Predictors: (Constant), learning relationships, creativity, dependence & fragility, self efficacy & commitment

b. Dependent Variable: strategic awareness